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V. A. KARGIN'S WORK IN POLYMERS AND COLLOID CHEMISTRY

V. A. Kargin was elected Member of the Academy of Sciences USSR, in the speciality of physical chemistry, at a general meeting of the academy which took place on 23 October 1953.

He is a prominent physical chemist and author of more than 120 publications in various fields of physical and colloid chemistry. During the first years of his scientific activity he carried out investigations of wide scope dealing with colloidal systems. These investigations have led to a radical change of ideas on the nature of solutions of hydrophobic colloids and the stability of such solutions. In his work Kargin demonstrated for the first time that purely chemical phenomena are of decisive importance for the formation and stability of solutions of hydrophobic colloids. The influence of these phenomena follows from the fact that the surface layer of colloidal particles is modified as a result of reactions with substances dissolved in the intermicellar liquid. These concepts were subsequently used by Kargin in successful work on the exchange of ions in soils, the development of a method for the stabilization of sandy soils saturated with water, and the creation of a new method for the elimination of electrolytes from colloidal solutions and precipitates by means of electrodialysis. The two last-mentioned methods have been introduced into practical use.

During recent years Kargin's investigations dealt mainly with the structure and properties of high-molecular compounds, i.e., cellulose, plastics, rubber, and proteins. Kargin's work on solutions of high-molecualr substances showed that these solutions must be regarded as systems which are in a state of thermodynamic equilibrium, while the process of the solution of amorphous polymers must be regarded as one of the mixing of liquids.

As a result of structure investigations by Kargin, in which both electronographic and X-ray methods were applied, the fact was established that cellulose and many of its derivatives have an amorphous structure. This is contrary

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to the views held by foreign investigators. Kargin together with his collaborators has also carried out extensive investigations of the mechanical and thermodynamic properties of ploymers: he subjected to study the relaxation processes involved in their deformation, proposed methods for the evaluation of the flexibility of polymer molecules, clarified the mechanism of the deformation of crystalline polymers, and carried out a number of other investigations in the field of physical chemistry and of the chemistry of polymers.

In recent years Kargin set himself the task of formulating a theory on the basis of which it would be possible to synthesize polymers with predetermined properties. Significant advances along this line have already been achieved. Kargin developed a thermomechanical method of investigations, and established the existence of three states of amorphous-liquid polymers (the vitreous, highly elastic, and viscous-fluid states). He found that the shape of the deformation-temperature curve depends on the structure and the molecular weight of the polymer, and proposed a quantitative method by means of which the flexibility of [the molecules of ?] polymers can be estimated on the basis of thermodynamic and mechanical properites. Kargin established the properties of polymer crystals which are connected with the presence of defects in them, and investigated the mechanism of deformation, showing that the process of deformation is accompanied by a specific type of recrystallization. The theory developed by Kargin is being applied practically in the synthesis of new polymers that have special properties.

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